

THE INVENTION CLAIMED IS:

1. A method for manufacturing a switch device comprising:
providing substrates collectively having defined therein a liquid metal switch and a
sub-channel connected to the liquid metal switch;
5 forming in a first one of the substrates a cavity filled with sacrificial material and
connected to the sub-channel;
forming a heater element at least in part over the sacrificial material;
forming conductive vias extending through one of the substrates to the heater element;
removing the sacrificial material; and
10 joining the substrates with an adhesive seal.
2. The method of claim 1 additionally comprising:
forming a barrier layer in the cavity and on a surface of the first one of the substrates; and
removing the barrier layer from the surface of the first one of the substrates.
3. The method of claim 1 wherein:
15 forming the cavity comprises depositing sacrificial material over the first one of the
substrates; and
planarizing the sacrificial material to be co-planar with the surface of the first one of
the substrates.
4. The method as claimed in claim 1 wherein forming the heater element
20 comprises:
depositing a seed layer over the sacrificial material;
depositing a heater material layer on the seed layer; and
defining the heater element in the seed layer and the heater material layer.
5. The method as claimed in claim 1 additionally comprising:
25 depositing passivation material prior to forming the heater element.
6. The method as claimed in claim 1 additionally comprising:
depositing passivation material over the heater element.
7. The method as claimed in claim 1 additionally comprising:
planarizing the bottom surface of one of the substrates.

8. A method for manufacturing a switch device comprising:
providing substrates collectively having defined therein a liquid metal switch and a
sub-channel connected to the liquid metal switch;
forming in a first one of the substrates a cavity filled with sacrificial material and
5 connected to the sub-channel;
forming a heater element of a refractory nitride at least in part over the filler material;
forming conductive vias extending through one of the substrates to the heater element;
removing the sacrificial material; and
joining the substrates with an adhesive seal.

9. The method of claim 8 additionally comprising:
forming a barrier layer comprising silicon nitride, aluminum nitride, titanium nitride,
aluminum, nickel chromium, chrome, platinum, gold, titanium, silver, nickel,
or a combination thereof in the cavity and on a surface of the first one of the
substrates; and
15 removing the barrier layer from the surface of the first one of the substrates.

10. The method of claim 8 wherein:
forming the cavity comprises depositing sacrificial material comprising phospho-
silicate glass, aluminum, or a combination thereof over the first one of the
substrates; and
20 planarizing the sacrificial material to be co-planar with the surface of the first one of
the substrates.

11. The method as claimed in claim 8 wherein forming the heater element
comprises:
depositing a seed layer comprising silicon nitride, titanium nitride, aluminum nitride,
25 chrome, nickel chrome, or a combination thereof over the sacrificial material;
depositing a heater material layer on the seed layer; and
defining the heater element in the seed layer and the heater material layer.

12. The method as claimed in claim 8 additionally comprising:
depositing passivation material comprising titanium nitride, aluminum nitride, silicon
30 nitride, silicon dioxide, platinum or a combination thereof prior to forming the
heater element.

13. The method as claimed in claim 8 additionally comprising:
depositing passivation material comprising titanium nitride, aluminum nitride, silicon
nitride, silicon dioxide, platinum or a combination thereof over the heater
element.
- 5 14. The method as claimed in claim 8 additionally comprising:
planarizing the bottom surface of one of the substrates to be parallel to the top surface
thereof.
- 10 15. A switch device comprising:
substrates collectively having defined therein a liquid metal switch, a cavity and a
sub-channel extending between the cavity and the liquid metal switch;
a heater element spaced from the substrates in the cavity, the heater element
comprising a refractory nitride, tungsten silicon nitride, tantalum nitride,
platinum, or a combination thereof;
conductive vias electrically connected to the heater element; and
15 an adhesive seal joining the substrates.
16. The device as claimed in claim 15 additionally comprising:
a barrier layer comprising silicon nitride, aluminum nitride, titanium nitride,
aluminum, nickel chromium, chrome, platinum, silver, gold, nickel, titanium,
or a combination thereof in the cavity.
- 20 17. The device as claimed in claim 15 wherein:
the heater element comprises:
a seed layer comprising silicon nitride, titanium nitride, aluminum nitride, chrome,
nickel chrome, or a combination thereof; and
heater material layer on the seed layer; and
25 the heater element is defined in the seed layer and the heater material layer.
18. The device as claimed in claim 15 additionally comprising:
passivation material comprising titanium nitride, aluminum nitride, silicon nitride,
silicon dioxide, platinum or a combination thereof between the heater element
and one of the substrates.
- 30 19. The device as claimed in claim 15 additionally comprising:

passivation material comprising titanium nitride, aluminum nitride, silicon nitride, silicon dioxide, platinum or a combination thereof over the heater element.

20. The device as claimed in claim 15 additionally comprising conductive pads electrically connected to the conductive vias.